CLAIMS

1. A method of fluid measurement comprising the steps of:

dividing a fluid or mixed gas and fluid flow between a first and second flow path each made up of one or more components;

causing the fluid to flow preferentially within the first path having one or more components of a relatively high surface to sectional area ratio;

measuring a parameter determined by the fluid in one or more components of the first path having a relatively high surface to sectional area ratio; and

determining the conductivity of the fluid based upon the measured parameter.

2. The method according to claim 1 wherein gas is at least partly separated from fluid to aid the preferential flow of fluid to the first flow path.

3. The method according to claims 1 and 2 wherein gas is at least partly separated from fluid to aid the preferential flow of fluid to the first flow path by the introduction of a swirling action.

4. The method according to any one of the preceding claims wherein gas is at least partly separated from fluid to aid the preferential flow of fluid to the first flow path by use of a surge or settling chamber type action.

5. The method according to any one of the preceding claims wherein fluid to the first flow path is accumulated to sustain a more continuous flow.

6. The method according to any one of the preceding claims wherein fluid flow from the first flow path is restricted to increase residence time or time for continuous flow.

7. The method according to any one of the preceding claims wherein fluid volume in the first flow path is minimised to increase residence time or time for continuous flow.

8. The method according to any one of the preceding claims wherein one or more components of the first flow path is fitted with sensors for measuring parameters determined by the fluid.

9. The method according to any one of the preceding claims wherein one or more components of the first flow path is fitted with sensors for measuring parameters determined by the fluid used to directly or indirectly represent the conductivity of the fluid.

10. The method according to any one of the preceding claims wherein one or more components in the second flow path is used to bi-pass fluid or gas and fluid mix not able to be accommodated by the first flow path.

11. The method according to claim 10 wherein one or more components in the second flow path is used to bi-pass fluid or gas and fluid mix not able to be accommodated by the first flow path with dimensions that minimise pressure or vacuum head loss.

12. The method according to any one of the preceding claims wherein one or more components in the second flow path is used to bi-pass fluid or gas and fluid mix not able to be accommodated by the first flow path is fitted with sensors to measure a parameter determined by the fluid or gas and fluid mix.

13. The method according to any one of the preceding claims wherein a measurement is made of a parameter determined by the fluid in one or more components of the second flow path having a relatively high surface to sectional area ratio;

14. The method according to any one of the preceding claims wherein the measured parameter in one or more components in the second flow path is used to directly or indirectly determine fluid mass and thereby flow rate and volume.

15. A fluid measurement apparatus comprising:

a manifold including a first and second flow path for conveying a fluid or mixed gas and fluid flow, causing the fluid to flow preferentially within one or more components in the first flow path having relatively high surface to sectional area ratio;

a sensor provided for the first path for measuring a parameter determined by the fluid; and

a conductivity determining circuit which represents the conductivity of the fluid based upon the parameter measured by the sensor.

16. The apparatus according to claim 15 wherein a manifold that employs a method according to claims 1 to 14 is used.

17. The apparatus according to claim 15 wherein a sensor constructed from electrodes distributed along the length of one or more components in the first path and at least partly surrounding the fluid either on the inside or outside of any containment walls is used.

18. The apparatus according to claims 15 to 17 wherein high frequency electric fields are coupled to the sensor electrodes.

19. The apparatus according to claims 15 to 18 wherein current or voltage phase or amplitude response is used directly or indirectly to represent conductivity and/or mass and thereby flow rate and volume.

20. A method for measurement of a parameter of a fluid comprising the steps of:

measuring a parameter determined by a fluid by sensing through a containment wall made of electrically insulating material; and

improving the measurement sensitivity by at least partially cancelling the effect of the dielectric properties of the containment wall.

21. The method according to claim 20 wherein the parameter to be measured is influenced by solutes or solvents that give rise to conductive properties.

22. The method according to any one of claims 20-21 where the fluid concerned is constrained to a form with relatively high surface to sectional area ratio within a containment wall made of electrically insulating material.

23. The method according to any one of claims 20-22 wherein a sensor is constructed from electrodes distributed along the length of the constrained form at least partly surrounding the fluid outside the containment walls.

24. The method according to any one of claims 20-23 wherein a high frequency voltage waveform is coupled to the sensor electrodes.

25. The method according to any one of claims 20-24 wherein a current phase or amplitude response is used to determine a measurement.

26. The method according to any one of claims 20-25 wherein the phasor addition of another signal cancels out at least part of the response due to the capacitance effect from the containment wall dielectric.

27. The method according to any one of claims 20-25 wherein a phase detector or amplitude detector is used to produce an output used to directly or indirectly represent conductivity and/or mass and thereby flow rate and volume.

28. The method according to claim 24 or 25 wherein voltage is used in place of current and current is used in place of voltage.

29. The method according to claim 20-28 wherein the measurement of the parameter of the fluid is used to directly or indirectly represent conductivity and/or mass and thereby flow rate and volume;

30. The method according to claim 20-28 wherein the measurement of the parameter of the fluid is manipulated with algorithms to filter and/or combine with other measurements and/or qualify by analysing time trends to improved reliability or accuracy of the measurement itself or what it is used to directly or indirectly represent.

31. An apparatus for measuring a fluid comprising:

a sensor arrangement for measuring a parameter determined by a fluid through containment walls made of an electrically insulating material;

a signal conditioning circuit that converts the measured parameter into an electrical form; and

a signal conditioning circuit that improves the measurement sensitivity by at least partially cancelling the undesirable effect of the dielectric properties of the containment wall.

32. The apparatus according to claim 31 wherein a method according to claims 20 to 30 is used.

33. The apparatus according to any one of claims 32-32 wherein an electrode coupling device with high common mode impedance is used in order to reduce effects of stray capacitance to the fluid and surrounding environment.

34. The apparatus according to any one of claims 31-33 wherein functions are realised within single components.

35. The apparatus according to any one of claims 31-34 wherein phase or amplitude detection involves converting current or voltage waveforms into square or rectangular waveforms with certain timing relationships.

36. The apparatus according to claim 35 wherein conversion to square or rectangular waveforms involves a comparator with a feedback loop acting on the duty cycle of the comparator output to adjust the comparator input.

37. The apparatus according to any one of claims 31-36 wherein a signal conditioning circuit provides and output used to directly or indirectly represent conductivity and/or mass and thereby flow rate and volume.

38. The apparatus according to any one of claims 31-36 wherein outputs from a signal conditioning circuit determine measurements that are acted on by an

algorithm to filter and/or combine with other measurements and/or qualify by analysing time trends to improved reliability or accuracy of the measurement itself or what it is used to directly or indirectly represent.

39. A method for determining dairy stock and plant performance comprising the steps of:

making performance measurements during a normal milking session;

collecting measurements to incrementally develop performance profiles during a normal milking session;

storing performance profiles as a completed set at the end of a normal milking session;

applying a best fit matching of a stored set to the current milking;

providing settings for user or pre-determined standards of performance; and

providing performance assessment for measurements during the current milking session using assessment criteria that are in part determined by stored profiles.

40. The method according to claim 39 wherein measurements are made automatically during the milking session.

41. The method according to any one of claims 39-40 wherein measurements are made for individual cows with or without retaining individual cow identification information.

42. The method according to any one of claims 39-41 wherein measurements are made or derived that represent stock performance including milk flow rate, volume, mass, yield and conductivity.

43. The method according to any one of claims 39-42 wherein measurements are made or derived that represent plant milking performance including pulsing action, milking time, and air or fluid flow rates or ratios.

44. The method according to any one of claims 39-43 wherein measurements are made or derived that represent plant cleaning performance including hot and cold cycles, fluid volume, time and detergent use.

45. The method according to any one of claims 39-44 wherein performance profiles include distributions, averages, maximums, minimums for individual cows or parts or all of a herd.

46. The method according to any one of claims 39-45 wherein stored performance characteristics for stock can be representative of standards defining a number of cows or a level within the herd.

47. The method according to any one of claims 39-46 wherein stored characteristics are matched on the basis of the last diurnal milking period corresponding to the current milking.

48. The method according to any one of claims 39-47 wherein performance during the current milking can be categorised as satisfactory or unsatisfactory or represented as a relative value.

49. The method according to any one of claims 39-48 wherein measurements result in local annunciation.

50. The method according to any one of claims 39-49 wherein measurements are used to determine end of milking or cluster removal for individual cows.

51. The method according to any one of claims 39-50 wherein individual cow identification system is incorporated.

52. The method according to any one of claims 39-51 wherein remote access is incorporated including access to a farm computer system, industry computer system or the internet.

53. An apparatus for determining dairy stock and plant performance comprising:

a unit for making measurements during a normal milking session;

a unit for collecting and developing measurement profiles, storing completed sets of profiles, matching stored profiles to the current milking and calculating performance criteria to be compared with measurements during the current milking session from standards of performance;

a unit for annunciation of performance during the current milking session; and

a network for communicating information between units.

54. The apparatus according to claim 53 wherein a method in claims 39 to 52 is used.

55. The apparatus according to claim 53 or claim 54 wherein measurements are made with a unit at each milking cluster.

56. The apparatus according to any one of claims 53-55 wherein measurements are made at each milking cluster in-line with the long milk hose from the milking cluster or the equivalent.

57. The apparatus according to any one of claims 53-56 wherein a commercial computer with appropriate adaptations and software or dedicated device with in-built computing capability is used for the unit collecting and developing measurements to define and store performance profiles and determining performance standards for the current milking session.

58. The apparatus according to any one of claims 53-57 wherein the unit for annunciation is also used to input user selected standards or to announce performance for the current milking session.

59. The apparatus according to any one of claims 53-58 wherein some or all of the units perform their functions automatically.

60. The apparatus according to any one of claims 53-59 wherein announcement of performance for the current milking session is made with a unit at the milking cluster position as part of the measuring unit or a separate unit.

61. The apparatus according to any one of claims 53-60 wherein communication between units is performed using a standard telecommunication network system or a dedicated network including a power line modem.